Códigos e Normas de Projeto, Fabricação, Inspeção, Montagem e Testes

Os técnicos e engenheiros de projeto, manutenção e inspeção que trabalham com equipamentos e tubulações das indústrias de óleo&gás, quer sejam instalações de refino e processamento de petróleo, ou de petroquímicas e ou de termoelétricas, e outras afins, devem conhecer as normas aplicáveis.
Como nossa indústria de óleo&gás tem projeto e construção com base em procedimentos e normas norte-americanas e européias, os textos são no idioma Inglês.
A ABNT-Associação Brasileira de Normas Técnicas tem convênio com a Entidade ISO-International Organization for Standardization e é autorizada a traduzir para o Português algumas normas técnicas selecionadas, porém não há nada semelhante com as entidades de normalização norte-americanas.
Assim, a depender de que ramo é a indústria, consultoria ou fábrica, convém que as normas a seguir relacionadas, aplicáveis, façam parte do acervo técnico, nas edições mais recentes.
Porém, as edições de normas ultrapassadas não devem ser descartadas, pois as novas edições não retroagem, e qualquer revisão ou ajuste em projeto existente deve ser realizado com as mesmas normas e especificações utilizadas originalmente.

> **Nota:**
> Aqui estão sendo enfatizados, particularmente, os códigos e normas relacionados aos equipamentos de caldeiraria: vasos de pressão, sistemas de tubulações, tanques de armazenamento, fornos, caldeiras, estruturas metálicas, etc.
> Os itens relativos aos equipamentos dinâmicos (bombas, compressores e turbina) e de instrumentação e controle não foram completamente abordados, porque os objetivos do *petroblog* são essencialmente voltados para os equipamentos estáticos e tubulações.

Caldeiras

ASME Boiler & Pressure Vessel Code
ASME Sec I - RULES FOR CONSTRUCTION OF POWER BOILERS

API RP 573: Inspection of Fired Boilers and Heaters
API RP 538 Industrial Fired Boilers for General Refinery and Petrochemical Service
ABNT NBR 12177: Caldeiras Estacionárias a Vapor – Inspeção de Segurança.

Corrosão e Deterioração

NACE MR0103 Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
NACE SP0198 Control of Corrosion under Thermal Insulation and Fireproofing Materials
NACE SP0472 Methods and Controls to Prevent In-Service Environmental Cracking of Carbon Steel Weldments in Corrosive Petroleum Refining Environments
API Recommended Practice 571, Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
API Recommended Practice 751, Safe Operation of Hydrofluoric Acid Alkylation Units
API Recommended Practice 932-B, Design, Materials, Fabrication, Operation, and Inspection Guidelines for Corrosion Control in Hydroprocessing Reactor Effluent Air Cooler (REAC) Systems
API Recommended Practice 941, Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants
API Recommended Practice 945, Avoiding Environmental Cracking in Amine Units

Fornos

API STANDARD 560 Fired Heaters for General Refinery Service
API STANDARD 530 Calculation of Heater-tube Thickness in Petroleum Refineries

Inspeção

API Recommended Practice 580, Risk-Based Inspection

API Recommended Practice 581, Risk-Based Inspection Technology
API Recommended Practice 574 - Inspection Practices for Piping System Components
API Std 570 - Piping Inspection Code: In-service Inspection, Rating, Repair, and Alteration of Piping Systems

ASME Section V: Nondestructive Examination;

N-2318 Inspeção em Serviço de Tanque de Armazenamento Atmosférico

Integridade
API 579-1/ASME FFS-1 Fitness-For-Service
BS 7910 Guide to methods for assessing the acceptability of flaws in metallic structures
ASME PTB-2 Guide to Life Cycle Management of Pressure Equipment Integrity

Isolamento térmico e Refratamento
ASTM C680 – Standard Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs Designation
ASTM C 1129 – Standard Practice for Estimation of Heat Savings by Adding Thermal Insulation to Bare Valves and Flanges

API Recommended Practice 936, Refractory Installation Quality Control Guidelines—Inspection and Testing Monolithic Refractory Linings and Materials

Juntas e gaxetas de vedação
ASME B16.20, Metallic Gaskets for Pipe Flanges—Ring-Joint, Spiral-Wound, and Jacketed
ASME B16.21 Nonmetallic Flat Gaskets for Pipe Flanges

Juntas de Expansão
EJMA - Expansion Joint Manufacturers Association

ASME B31.3 - Process Piping
APPENDIX - METALLIC BELLOWS EXPANSION JOINTS

ASME Boiler & Pressure Vessel Code VIII Division 1
RULES FOR CONSTRUCTION OF PRESSURE VESSELS
MANDATORY APPENDIX 26 - BELLOWS EXPANSION JOINTS

Ligações flangeadas e Juntas de vedação
ASME PCC-1 Guidelines for Pressure Boundary Bolted Flange Joint Assembly
ASME B16.48 Line Blanks
ASME B16.5 Pipe Flanges and Flanged Fittings NPS 1⁄2 Through NPS 24
ASME B16.47 Large Diameter Steel Flanges: NPS 26 Through NPS 60 Metric/Inch Standard

MSS SP-6 Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings

Manutenção e Reparos
ASME PCC-2 Repair of Pressure Equipment and Piping

Máquinas
API RECOMMENDED PRACTICE 686 - Recommended Practices for Machinery Installation and Installation Design

Materiais de construção
ASME Boiler & Pressure Vessel Code

II Part A Ferrous Material Specifications
(Beginning to SA-450)
MATERIALS

ASME Boiler & Pressure Vessel Code
II Part A Ferrous Material Specifications
(SA-451 to End)
MATERIALS
ASME Boiler & Pressure Vessel Code
II Part B Nonferrous Material Specifications
MATERIALS

ASME Boiler & Pressure Vessel Code
II Part C Specifications for Welding Rods, Electrodes, and Filler Metals
MATERIALS

ASME Boiler & Pressure Vessel Code
II Part D Properties
MATERIALS

API RECOMMENDED PRACTICE 571
Damage Mechanisms Affecting Fixed Equipment in the Refining Industry

ANSI/UL 1709
Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel

API Recommended Practice 578, Material Verification Program for New and Existing Alloy Piping Systems
API Specification 5L, Specification for Line Pipe

Mecanismos de danos em equipamentos e tubulações
NACE Standard MR0103
Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
NACE Standard MROI75
Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gas production -
Part 1:
General principles for selection of cracking-resistant materials
Part 2:
Cracking-resistant carbon and low alloy steels, and the use of cast irons
NACE Standard RP0472
Methods and Controls to Prevent In-Service Environmental Cracking of Carbon Steel Weldments in Corrosive Petroleum Refining Environments
NACE Publication 8X194
Report Materials and Fabrication Practices for New Pressure Vessels Used in Wet H2S Refinery Service

Permutadores de calor
TEMA - The Tubular Exchanger Manufacturers Association, Inc. Shell and Tubes Heat Exchangers

ASME Boiler & Pressure Vessel Code VIII Division 1
RULES FOR CONSTRUCTION OF PRESSURE VESSELS

API STANDARD 660 Shell–and–Tube Heat Exchangers for General Refinery Services
API STD 661 Petroleum, Petrochemical, and Natural Gas Industries - Air-cooled Heat Exchangers,

API STANDARD 662 Plate Heat Exchangers For General Refinery Services

Purgadores de vapor
ISO 7841 Automatic steam traps - Determination of steam loss - Test methods

ASME PTC 39 – Steam traps - Performance test code.

Segurança pessoal
API Publication 2217A, Guidelines for Work in Inert Confined Spaces in the Petroleum and Petrochemical Industry

Soldagem
ASME Boiler & Pressure Vessel Code ASME IX Welding

API RECOMMENDED PRACTICE 577 Welding Processes, Inspection, and Metallurgy
API RECOMMENDED PRACTICE 582 Welding Guidelines for the Chemical, Oil, and Gas Industries
API STANDARD 1104 Welding of Pipelines and Related Facilities Pipeline Segment

Tanques de Armazenamento
API Recommended Practice 575 Guidelines and Methods for Inspection of Existing Atmospheric and Low Pressure Storage Tanks
API STANDARD 650 Welded tanks for oil storage
API Recommended Practice 651 Cathodic Protection of Aboveground Petroleum Storage Tanks
API Standard 620 - Design and Construction of Large, Welded, Low-Pressure Storage Tanks
API STANDARD 653 Tank Inspection, Repair, Alteration, and Reconstruction
API PUBLICATION 937-A Study to Establish Relations for the Relative Strength of API 650 Cone Roof Roof-to-Shell and Shell-to-Bottom Joints
API PUBLICATION 937 Evaluation of Design Criteria for Storage Tanks With Frangible Roof Joints
API Recommended Practice 2003 Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents
API Recommended Practice 2210 Flame Arresters for Vents of Tanks Storing Petroleum Products

Tochas
API STANDARD 537 Flare Details for General Refinery and Petrochemical Service

Tubulações de processo e de utilidades
ASME B31.1 - Power Piping
ASME B31.3 - Process Piping
ASME B 31.4 - Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
ASME B 31.8 Gas Transmission and Distribution Piping Systems
ASME B1.20.1: Pipe Threads, General Purpose
ASME B31G: Manual for Determining the Remaining Strength of Corroded Pipelines
ASME B16.25, Buttwelding Ends
ASME B36.10M, Welded and Seamless Wrought Steel Pipe
ASME B36.19M, Stainless Steel Pipe

API 570 - Piping Inspection Code; Inspection, Repair, Alteration, and Rerating of In-Service Piping Systems
API RP 574 - Inspection Practices for Piping System Components Downstream Segment
API RECOMMENDED PRACTICE 2028 Flame Arresters in Piping Systems

PFI ES7 - MINIMUM LENGTH AND SPACING FOR WELDED BRANCH CONNECTIONS
Pipe Fabrication Institute

N-115 Fabricação e Montagem de Tubulações Metálicas

Válvulas industriais

API Spec 6D Specification for Pipeline Valves
API SPECIFICATION 6FA Specification for Fire Test for Valves
API Standard 6FC Fire Test for Valve with Automatic Backseats.
API Standard 594, Check Valves: Flanged, Lug, Wafer and Butt-welding
API STANDARD 598 Valve Inspection and Testing
API Standard 599, Metal Plug Valves—Flanged, Threaded and Welding Ends
Petroleum and Natural Gas Industries
API STANDARD 600 Steel Gate Valves—Flanged and Butt-welding Ends, Bolted Bonnets
API Standard 602, Steel Gate, Globe and Check Valves for Sizes DN 100 and Smaller
API Standard 603, Corrosion-resistant, Bolted Bonnet Gate Valves—Flanged and Butt-welding Ends
API STANDARD 607 Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
API Standard 608, Metal Ball Valves—Flanged, Threaded and Welding Ends
API STANDARD 609 Butterfly Valves: Double-flanged, Lug- and Wafer-type
API RECOMMENDED PRACTICE 621 Reconditioning of Metallic Gate, Globe, and Check Valves
API STANDARD 622 Type Testing of Process Valve Packing for Fugitive Emissions
API STANDARD 624 Type Testing of Rising Stem Valves Equipped with Graphite Packing for Fugitive Emissions
API STANDARD 641. Type Testing of Quarter-Turn Valves for Fugitive Emissions

ABNT NBR 15827 Válvulas industriais para instalações de exploração, produção, refino e transporte de produtos de petróleo — Requisitos de projeto e ensaio de protótipo

ISO 10497 Testing of valves — Fire type-testing Requirements
ISO 19921 Ships and marine technology - Fire resistance of metallic pipe components (valve, fitting, coupling or similar piping component) with resilient and elastomeric seals — Test methods

ASME B16.25 Buttwelding Ends
ASME B16.34 Valves - Flanged, Threaded, and Welding End

ABNT NBR 15827
Válvulas industriais para instalações de exploração, produção, refino e transporte de produtos de petróleo — Requisitos de projeto e ensaio de protótipo

Vasos de Pressão

ASME Boiler & Pressure Vessel Code VIII Division 1
Rules for Construction of Pressure Vessels

ASME Boiler & Pressure Vessel Code VIII Division 2
Rules for Construction of Pressure Vessels
Alternative Rules

ASME PCC-2
Repair of Pressure Equipment and Piping

ABNT NBR 15417: Vasos de Pressão - Inspeção de Segurança em Serviço

API STANDARD 510: Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration
API RP 572: Inspection of Pressure Vessels (Towers, Drums, Reactors, Heat Exchangers, and Condensers)

API STANDARD 660 Shell-and-tube Heat Exchangers
API RECOMMENDED PRACTICE 934-A Materials and Fabrication of 2 1/4Cr-1Mo, 2 1/4Cr-1Mo-1/4V, 3Cr-1Mo, and 3Cr-1Mo-4V Steel Heavy Wall Pressure Vessels for High-temperature, High-pressure Hydrogen Service
API RECOMMENDED PRACTICE 934-C Materials and Fabrication of 1 1/4Cr-1/2Mo Steel Heavy Wall Pressure Vessels for High-pressure Hydrogen Service Operating at or Below 825 °F (441 °C)
API RECOMMENDED PRACTICE 934-E Recommended Practice for Materials and Fabrication of 11/4CR-1/2Mo Steel Pressure Vessels for Service Above 825 °F (440 °C)
API STANDARD 2510
Design and Construction of LPG Installations
API PUBLICATION 2510A
Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities

Válvulas de Alívio e Segurança
API STANDARD 520-1 Sizing, Selection, and Installation of Pressure-relieving Devices in Refineries
Part I—Sizing and Selection
API RECOMMENDED PRACTICE 520-2 Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries Part II—Installation
API Standard 526 Flanged Steel Pressure Relief Valves.
API Standard 527 Seat Tightness of Pressure Relief Valves
API Standard 574 Inspection Practices for Piping System Components.
API RECOMMENDED PRACTICE 576 Inspection of Pressure-relieving Devices
API STANDARD 2000 Venting Atmospheric and Low-pressure Storage Tanks
API STANDARD 521 Pressure-relieving and Depressuring Systems
API STANDARD 526 Flanged Steel Pressure relief Valves

ASME PTC 25-2014 Pressure Relief Devices

Combate a fogo
NFPA® 11 - Standard for Low-, Medium-, and High-Expansion Foam
API STANDARD 2510 - Design and Construction of LPG Installations
API PUBLICATION 2510A - Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities

Petrobras N-1645 - Critérios de Segurança para Projeto de Instalações Fixas de Armazenamento de Gás Liquefeito de Petróleo

Cargas Eletroestáticas
API RECOMMENDED PRACTICE 2003-Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents
NFPA 77 - Recommended Practice on Static Electricity

Livros Técnicos

Além dos códigos e normas, é recomendada uma biblioteca de livros técnicos, sobre vasos de pressão e sistemas de tubulações.

1. PERRY'S CHEMICAL ENGINEERS' HANDBOOK
Author: Robert H. Perry
Editors:
Don W. Green
Deane E. Ackers Professor of Chemical and Petroleum Engineering,
University of Kansas

James O. Maloney
Professor Emeritus of Chemical Engineering,
University of Kansas
Copyright by The McGraw-Hill Companies, Inc.
PERRY'S CHEMICAL ENGINEERS' HANDBOOK SEVENTH EDITION

2. PRESSURE VESSEL DESIGN MANUAL - THIRD EDITION
Illustrated procedures for solving major pressure vessel design problems
Author: Dennis R. Moss
Copyright *0* 2004, Elsevier, Inc.

3. TABELAS E GRÁFICOS PARA PROJETOS DE TUBULAÇÃO
Pedro C. Silva Telles
Darcy G. Paula Barros

4. TUBULAÇÕES INDUSTRIAIS – MATERIAIS, PROJETO E MONTAGEM
Pedro C. Silva Telles

5. MATERIAIS PARA EQUIPAMENTOS DE PROCESSO
Pedro C. Silva Telles

6. TUBULAÇÕES INDUSTRIAIS – CÁLCULO
Pedro C. Silva Telles

7. VASOS DE PRESSÃO
Pedro C. Silva Telles